DOCUMENT RESUME

ED 391 511 IR 017 664

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TITLE The Impact of Line on Perceptions of an ID Process Model.
PUB DATE [95]
NOTE 13p.; In: Eyes on the Future: Converging Images, Ideas, and Instruction. Selected Readings from the Annual Conference of the International Visual Literacy Association (27th, Chicago, IL, October 18-22, 1995); see IR 017 629.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Diagrams; Higher Education; *Instructional Design; Introductory Courses; Models; *Preservice Teacher Education; *Student Reaction; Undergraduate Students; Use Studies; *Visual Perception; Visual Stimuli
IDENTIFIERS Curves; Line Drawings

ABSTRACT

This study investigated the influence of the visual display of an instructional design (ID) model on preservice teachers' perceptions of the ID process. Forty-six undergraduate education majors (29 females and 17 males) enrolled in an introductory education class during the spring of 1995 at an institution in the United States' Rocky Mountain west participated in this study. The students were assessed on their initial knowledge and perceptions of the ID process. Students were then given a three hour introduction to ID; after instruction, students' perceptions of the ID process again were assessed. After this posttest, students were given first one and then the second of two visual depictions of the ID process; responses were assessed after each. One model was drawn with curved lines and ovals and the other original model was formed with straight lines and rectangles. Half of the students were given the curved/oval model first and the remaining half were presented with the visual models in reverse order. Preliminary data analysis suggested that the visual display of the ID model influenced student perceptions of the ID process. Overall, students used the same words with similar meanings to describe both the positive and negative aspects of the ID process regardless of whether curved or straight lines were used to visually depict the model. Ten figures depict information on ID models and assessment results. (AEF)

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The Impact of Line on Perceptions of An ID Process Model

ED 391 511

Landra L. Rezabek & John J. Cochenour

Background and Rationale

During years of teaching principles of instructional design (ID) to graduate and undergraduate education majors, the authors have noted that, when initially presented with models that use rectangles and straight lines to visualize the process (e.g. Dick & Carey, 1990; Seels & Glasgow, 1990; Smith & Ragan, 1993), students' first impression of the ID process is that it is rigid, inflexible, fixed, and perhaps not very relevant for use in a real-world K-12 classroom. However, when students have first been introduced to Kemp's circular model (Kemp, 1985; Kemp et al., 1994), students' initial perceptions of the ID process are that the process is somewhat flexible and adaptive and may be beneficial to them as teachers. Kemp himself indicates (Kemp, 1985, p. 12; Kemp et al., 1994, p. 10) that his choice of a circular model was chosen to visually emphasize the flexibility of his approach to instructional design.

From the perspective of visual communication, vertical and horizontal lines, squares, and blocks are associated with feelings of stability and stasis while circular forms and curved lines imply movement, motion, and dynamism (Dondis, 1973; Heinich, Molenda, & Russell, 1993). If, when working to encourage teachers to use an instructional design model as a flexible framework for designing good instruction and not as a lock-step, rigid format to be followed without integrating one's own professional expertise, then the manner in which an instructional design model is visually depicted becomes an important instructional consideration. Students' perceptions of the instructional design process itself may be heavily influenced by the way in which ID models are visually depicted.

In thinking about students' potential perceptions of both the process of instructional design and the models used to visualize it, the authors identified three factors of primary interest: flexibility, organization, and value. Flexibility, used in the context of this study, is the characteristic of the ID process or model that indicates the degree to which it is responsive to being adapted or changed. Organization, as defined by the authors, is the characteristic of the ID process or model that indicates the

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manner of relationship among the process/model elements, the overall structure and pattern of the process/model, and the logic, meaning, and clarity of that pattern. Value is the characteristic of the ID process or model that indicates the degree of usefulness or importance.

This is the seminal investigation in a planned series of investigations and, as such, the major goal was to determine if the way in which the instructional design process is visually depicted by a two-dimensional model influences preservice teacher perceptions of the flexibility, organization, and value of the ID process itself.

Research Questions

As indicated above, this study was designed to investigate the influence of the visual display of an instructional design model on preservice teachers' perceptions of the instructional design process. The overall research hypotheses included the following:

1. Providing preservice teachers with information about the instructional design process will increase their perceptions of the flexibility, organization, and value of the process.

2. Preservice teachers will perceive the ID process to be more flexible when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

3. Preservice teachers will perceive the ID process to be no more or no less organized when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

4. Preservice teachers will perceive the ID process to be more valuable when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

5. Prior experience with ID, prior experience teaching, anticipated teaching level or content, year in college, and gender will have no effect upon preservice teachers' perceptions of the flexibility, organization, or value of the ID process as visually depicted by either curved/oval or straight/rectangle models.

Additionally, the authors were interested in assessing preservice teachers' general reactions to the instructional design process. Study participants were asked to respond to the following:

6. List any other words to describe how you feel about the instructional design process.

7. Which model do you think best represents what happens in the instructional design process?

8. If you were going to teach some of the principles of the instructional design process to someone else who was planning to be a teacher, which model would you show to the other person as you explained the instructional design process?

Methodology

Forty-six undergraduate education majors enrolled in an introductory education class during the Spring 1995 semester at an institution in the Rocky Mountain west participated in this study. Twenty-nine (63%) female students and 17 (37%) male students completed the data collection in-

struments. As a group, they had completed an average of 13.13 years of schooling and represented a wide range of teaching levels and content areas. Nineteen (41%) had taught in some capacity before, whether in a traditional classroom or as an aide, coach, community service volunteer, or religious education instructor. None had any experience with the instructional design process.

The students were assessed on their initial knowledge and perceptions of the ID process. The assessment included a self-report of demographic and experiential characteristics including prior experience with instructional design ("none" or "some") and a 26-item, 5-point Likert-type scale on which students indicated the degree to which they felt one or the other of a particular set of antonyms described their feelings about the ID process (See Figures 1, 2, and 3). Students were then given a three hour introduction to instructional design as part of a standard curriculum. During this period of direct oral instruction over the material, students received a printed outline of the "steps" in the Smith-Ragan (1993) ID model but no visual representation of the model. After instruction, students' perceptions of the ID process again were assessed using the 26-item Likert-type scale. After this posttest, students were given first one and then the second of two visual depictions of the Smith-Ragan ID model. One model was drawn with curved lines and ovals and the other original model was formed with straight lines and rectangles. The layout, size, font styles, and other visual elements remained constant between the two models (See Figures 4 and 5).

Half of the students were given the curved/oval model first and then completed the 26-item assessment and one question

Figure 1
Flexibility Antonym Pairs

Word Pairs: Flexibility Characteristic	
structured	unstructured
inflexible	flexible
rigid	adaptable
firm	malleable
regulated	sporadic
unyielding	yielding
exacting	modifiable
fixed	pliable
constant	changing

Figure 2
Organization Antonym Pairs

Word Pairs: Organization Characteristic	
linear	circular
abstract	concrete
random	sequential
inconsistent	consistent
informal	formal
irrational	rational
misleading	clear
complicated	simple
disorganized	organized
unplanned	planned
haphazard	methodical
disorderly	orderly

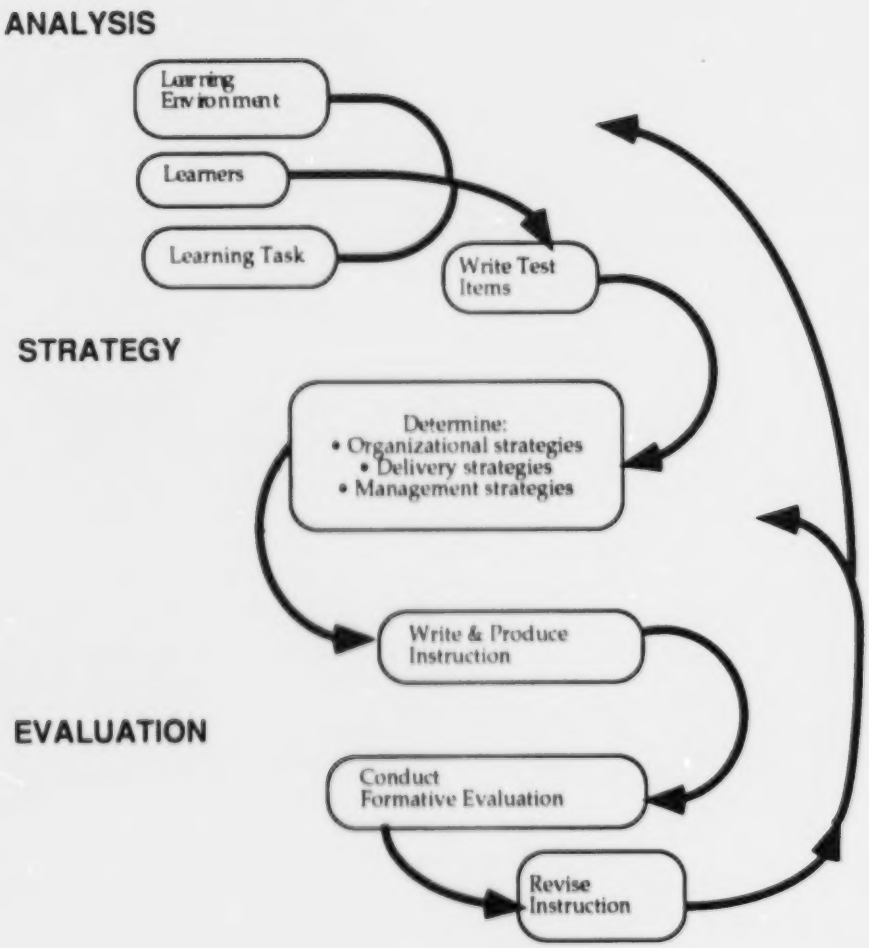
Figure 3
Value Antonym Pairs

Word Pairs: Value Characteristic	
unhelpful	helpful
difficult	easy
confusing	logical
foolish	sensible
worthless	valuable

Figure 4
Curved/Oval ID Model

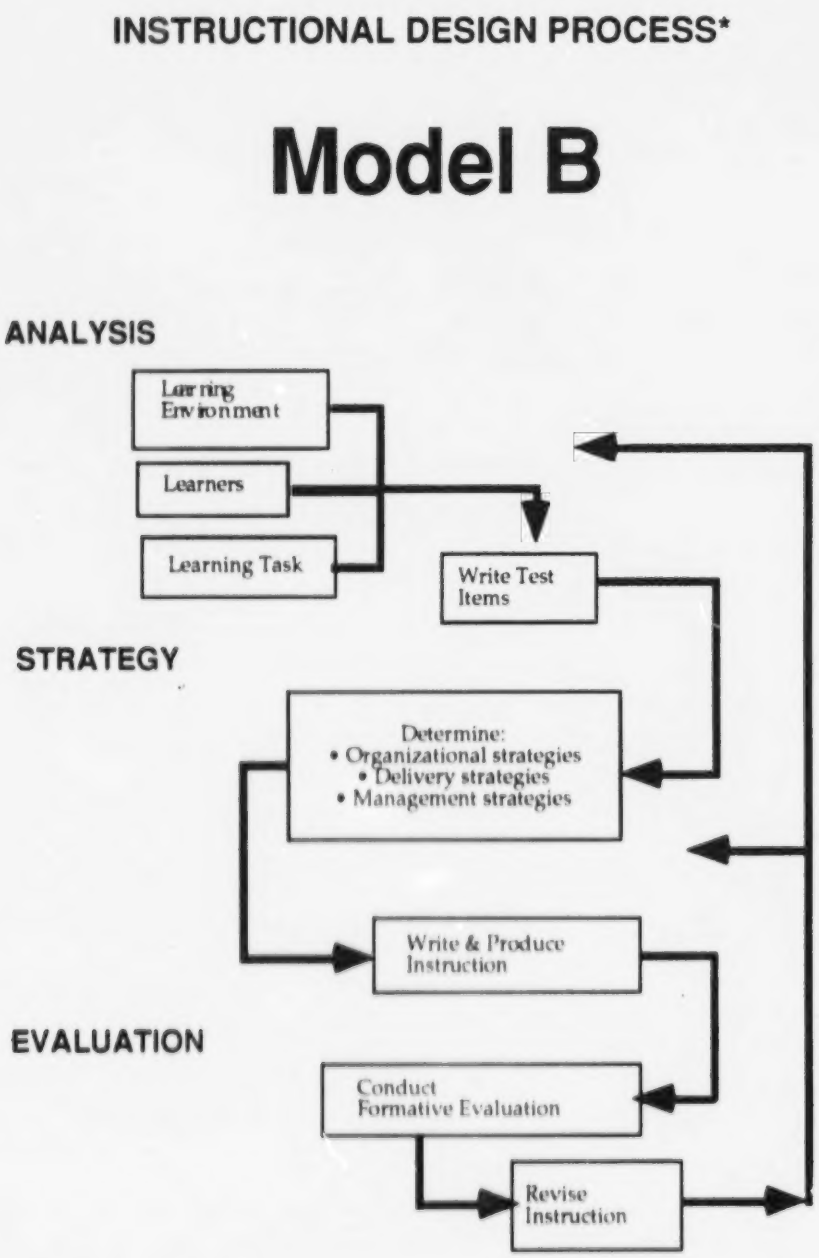
INSTRUCTIONAL DESIGN PROCESS*

Model A



*Adapted from Smith, P. L. & Ragan, T. J. (1993) *Instuctional Design*. New York: Merrill

Figure 5
Straight/Rectangle ID Model



*Adapted from Smith, P. L. & Ragan, T. J. (1993) *Instructional Design*. New York: Merrill

probing for any other words they associated with instructional design process. The model and responses were collected and students then viewed the straight/rectangle model and answered the same 26 response items and follow-up question while referring to the second visual. The remaining half of the students were presented with the visual models in the reverse order. After viewing both models, all students were ask to specify which model (curved or straight) best represented what "happens" in the instructional design process and which of the two models they would use if they were teaching the ID process to someone else who was planning to be a teacher.

Results

Preliminary data analysis suggests that the visual display of the instructional design model indeed influenced student perceptions of the instructional design process, though difficulties in data entry and confounding effects discovered in the data collection procedures discussed below have delayed analysis of some of the results. Although the data analysis is not yet complete, results and trends which appear to be valid are presented below.

Regarding Question 1, a paired two-sample for means t-test is significant at the .05 level. This suggests that preservice teachers did show a change in their responses between the pretest and the posttest assessing their perceptions of the flexibility, organization and value of the instructional design process, though current data do not yet suggest where these changes occurred. On the posttest, respondents were highly consistent in choosing the terms *sensible* and *valuable* to describe the ID process, both terms with means in excess of 4.5 on a 1 to 5 scale.

Initial quantitative analysis has not shown significant differences in any of the remaining questions, but this work has only begun due to the recent recognition of a coding error discovered during data entry. In observing the responses to the word pair choices describing the two ID models, respondents tended to be very neutral. There was no significant deviation from the central choice (3) in most cases.

In analyzing the open-ended responses, the researchers were again overwhelmed by the amount and complexity of the data. However, throughout this initial phase of data analysis, interesting as well as inexplicable patterns have emerged. This portion of the data analysis focused specifically on student responses to the following statements that related specifically to Questions 6 through 8 above:

A. When you look at **Model A** [whichever was the first model presented], list any other words to describe how you feel about the *instructional design process*.

B. When you look at **Model B** [whichever was the second model presented], list any other words to describe how you feel about the *instructional design process*.

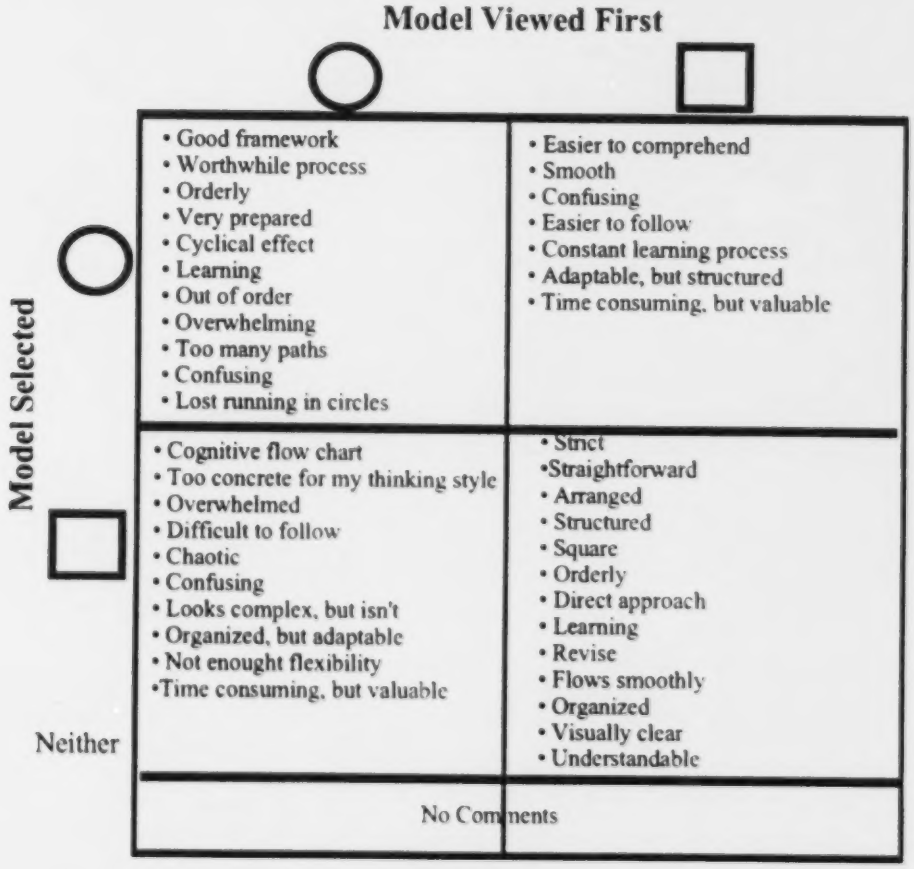
C. Which model do you think best represents what happens in the instructional design process? Explain why you feel this way.

D. If you were going to teach some of the principles of the instructional design process to someone else who was planning to be a teacher, which model would you show to the other person as you explained the instructional design process? Explain why you feel this way.

E. Please feel free to make any additional comments you wish to share.

Thus far, demographic and experiential characteristics of the students do not appear to influence responses to any of the questions posed above. Student responses to Questions A and B above are summarized in Figure 6. Though data were summarized in a manner to observe any influence caused by the order in which the students viewed the models, presentation order does not appear to influence these responses. Student-generated words used to describe the *instructional design process as depicted in the curved/oval model* included the terms orderly, confusing, smooth, overwhelming, adaptable but structured, time consuming but valuable, out of order, easier to comprehend, and easier to follow. Quite similarly, student-generated words used to describe the *instructional design process as depicted in the straight/rectangle model* included the terms orderly, confusing, flows smoothly, overwhelmed, organized but adaptable, time consuming but valuable, chaotic, understandable, and straightforward. Overall, the same words or those with similar meanings were used to describe both the positive and negative aspects of the instructional design process regardless of

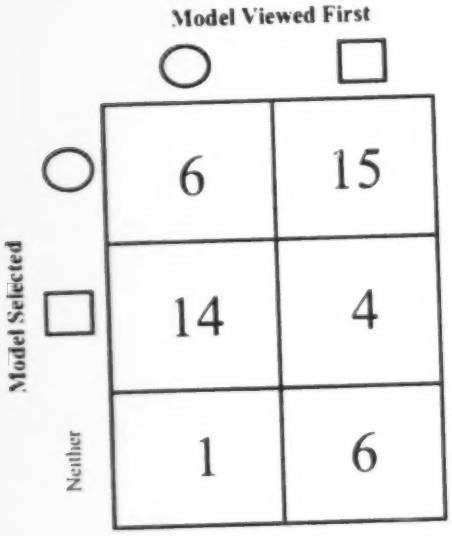
Figure 6
Words Chosen to Describe the ID Process



whether curved or straight lines were used to visually depict the model. In addition, similar or the same words were not necessarily provided by the same students.

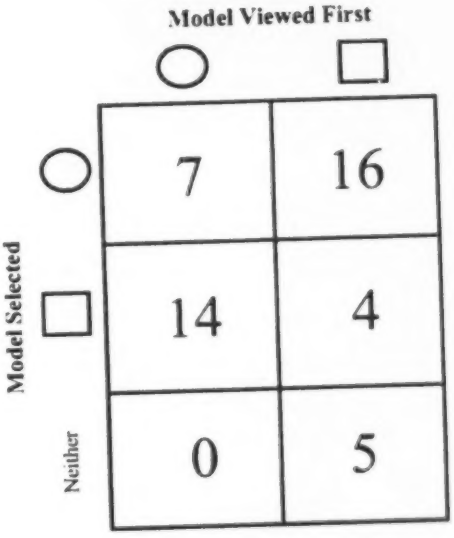
In thinking about Question C above, Figure 7 presents the number of students who indicated a preference for either the

Figure 7
Number of Students Selecting Each Model as "Best"



circle, the square, or neither model as the best representation of what happens in the instructional design process. Descriptive statistics indicate that, of the 46 preservice teachers, 21 students (46%) believed that the curved/oval model best represented the ID process, 18 students (39%) believed that a straight/rectangular models best did so, and 7 students (15%) believed neither model was better. When the curved/oval (circle) model was viewed first by 21 students, 6 students (29%) indicated that it was the best model, 14 students (67%) indicated that the straight/rectangle (square) model was the best, and 1 student (5%) indicated neither was better. When the straight/rectangle model was viewed first by 25 students, 15 students (60%) indicated that the curved/oval model was the best, 4 students (16%) indicated that the straight/rectangle model was best, and 6 students (24%) indicated that neither was better. Overall, the second model to be viewed tended to be

Figure 8
Number of Students Selecting Each Model as "Choice to Use to Teach"



chosen as the best model, regardless of the order in which the models were presented.

Data relating to Question D above are presented in Figure 8. In a similar manner to the data collected for Question C, descriptive statistics indicate that of the 46 preservice teachers, 23 students (50%) believed that they would use the curved/oval model to teach the ID process, 18 students (39%) believed that they would use the straight/rectangle model to do so, and 7 students (11%) had no preference for use. When the curved/oval (circle) model was viewed first by 21 students, 7 students (33%) indicated that it was the model they

would use, 14 students (67%) indicated that they would use the straight/rectangle (square) model , and no students responded that they had no preference for use. When the straight/rectangle model was viewed first by 25 students, 16 students (64%) indicated that the curved/oval model was the one they would use, 4 students (16%) indicated that the straight/rectangle model was the one they would use, and 5 students (20%) indicated that they had no preference for use. With overall data strikingly similar to those collected for Question C, the second model viewed, regardless of whether it was curved/oval or straight/rectangle, typically was chosen as the best model—again, regardless of the order in which the models were presented. Additionally, though students strongly tended to select the same model as the "best" one and their "choice to use to teach," this was not always the case.

Data displayed in Figures 9 and 10 also provide insight into the students' perceptions of the "best" and "choose to use to teach" models as they provide verbal explanations of their decisions. Again, the order of presentation did not appear to affect the terms chosen to describe student reasoning behind their preferences. As depicted in Figure 9, regardless of whether it was presented first or second, if the curved/oval model was preferred, the most common reasons included that it was more flexible, more modifiable, and more adaptable.

Figure 9
Reasons Underlying Preference for "Best" Model

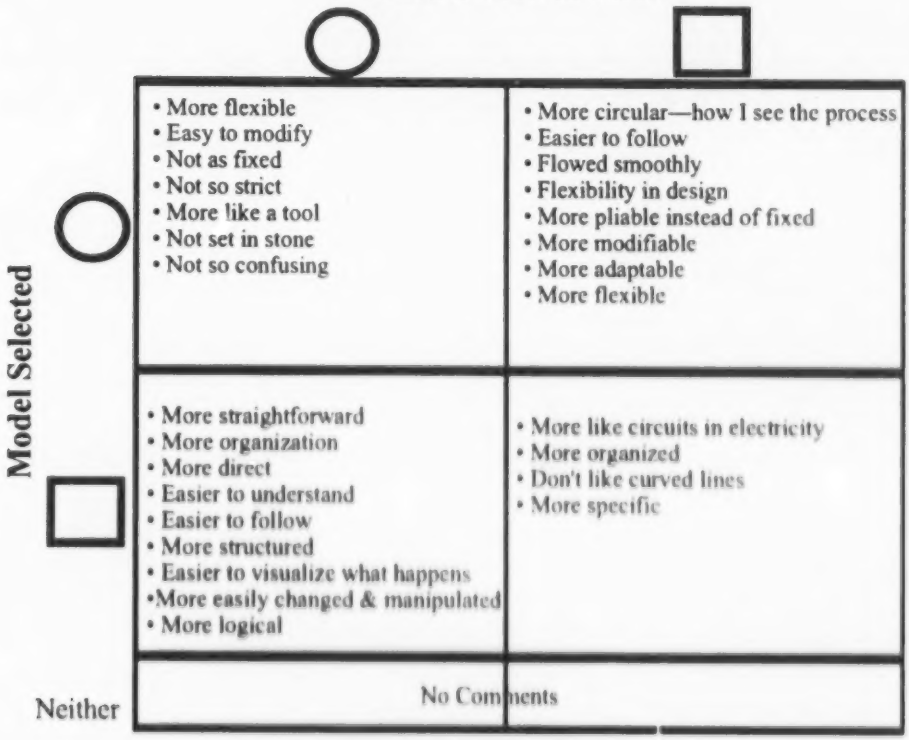
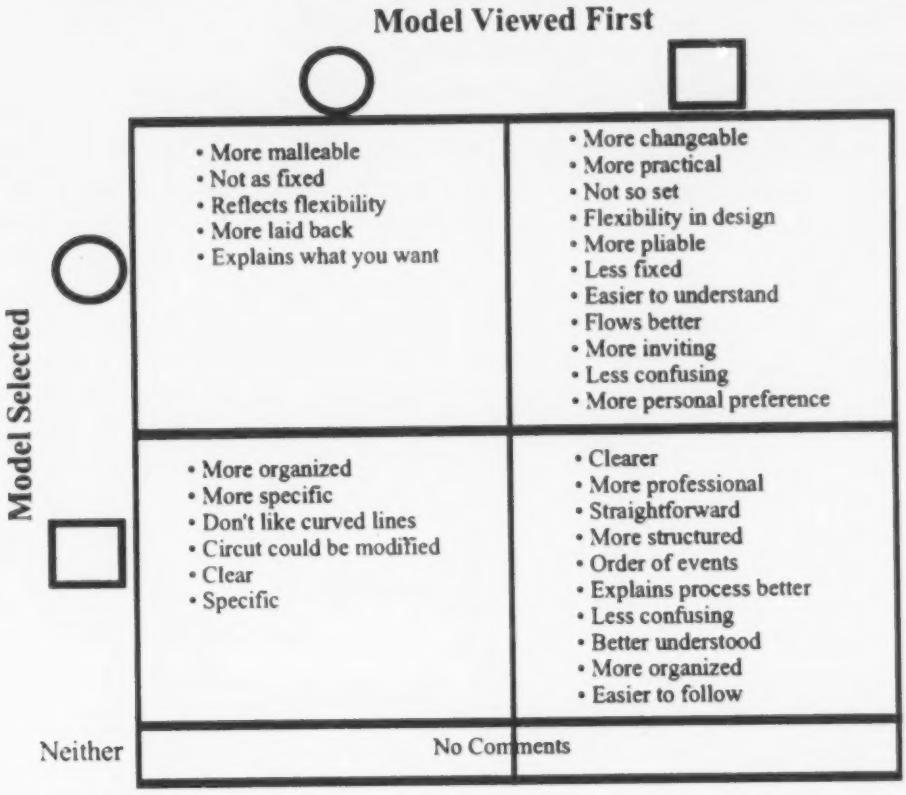


Figure 10
Reasons Underlying Preference for "Choice to Use to Teach" Model



Regardless of whether the straight/rectangle model was viewed first or second, it was described as more organized, easier to follow, and easier to understand. No comments were made if students did not perceive one model as better than the other. In a similar manner, results displayed in Figure 10 indicate that the order of presentation did not appear to affect students' choice of words generated to describe their preference of one model or the other that they would chose to use when teaching someone about ID. Whether presented first or second, the curved/oval model was perceived as more malleable, not as fixed, more flexible, easier to understand, and more flowing. Again regardless of presentation order, the straight/rectangle model was perceived as more organized, more clear, more structured, easier to understand, and easier to follow. Students who selected no model preference indicated that they would integrate the use of both models but did not supply additional words to describe the models.

Discussion and Recommendations

Regarding Question 1, data indicate that preservice teachers changed their responses between the pretest and posttest assessing their perceptions of the flexibility, organization, and value of the ID pro-

cess. Though the data analysis is not complete, student indications that ID is perceived as sensible and valuable comfort the researchers, who believe that the ID process indeed is worthwhile to teach to these preservice teachers. Researchers are concerned about the significance and discriminative value of the some of the additional terms selected for use in the data collection instrument and will continue to refine it.

Questions 2, 3, and 4 are not supported or refuted by quantitative data at this point in the study. Researchers' "gut reaction" remains that the visual display of the ID process does in some way influence preservice teachers' perceptions of the flexibility, organization, and value of the ID process itself, but refinement to the instrument and continued investigation are needed.

In considering Question 5, open-ended responses indicate that the demographic and experiential characteristics of the students that were selected for this study may not be as influential in determining student preferences as other factors not yet investigated. Among some of the additional characteristics possibly influencing preservice teachers' perception of the ID process itself and the way in which it is visually depicted include individual learning style preferences; cognitive style factors such as locus of control and field dependence/independence; educational background such as electrical engineering training or experience in reading other types of flowcharts; individual preference for structure or flexibility; and personal visual appeal. In conjunction with data collected to address Question 6, this observation is supported by the similarity between the words students consistently generated to describe both the curved/oval model and the straight/rectangle model and the ID process itself. Apparently, student characteristics other than those identified have a greater impact on their perceptions of the ID process and the visual representation of the model, and this is an area for continued investigation.

With regard to Questions 7 and 8, the fact that students consistently identified the second model that they saw as both the "best" and the "choice to use to teach" indicates a possible problem in the data collection procedures. The first model was collected with student response sheets after students had completed them to prevent students from referring to their previous answers. However, in doing so, students apparently "forgot" how the first model looked and tended to prefer the second model, perhaps solely because they could refer to it while answering the questions. Future iterations of this study will allow students to keep both their models and their response sheets while completing the entire package of materials.

Also with respect to Questions 7 and 8, current data analysis does not indicate whether a slight student preference to identify the curved/oval model as "best" as well as the "choice to use to teach" is statistically significant. Because of the apparent flaw in data collection procedures mentioned above, these current data will not be used in upcoming iterations of the study and researchers chose not to expend the considerable amount of time needed to further analyze these current results.

The importance of the visual display of ID models for professionals teaching the instructional design process is summarized by two very different quotations from two sophomore students, both of whom had no preference for a "best" or "choice to use to

teach" model. One student lamented: "I understand the presentation that you gave and it was very helpful . . . but I don't get these dang models!" This comment underscores the importance of presenting a visual representation of the ID process that facilitates—not hinders—students' acquisition of the principles underlying the instructional design process. Numerous comments also could be cited to support the observation of students' preferences of models based on their own personal preferences for structure or flexibility. However, one very astute student concluded: "The only difference is the lines as far as I could see. To me lines that are curved or lines that are straight still point to the same thing. . . . Curved lines may indicate flexibility & straight lines more structure & less variance. I look at the design as both flexible & structured." Since this is one of the key messages regarding the instructional design process that the researchers attempt to convey to preservice teachers, perhaps preservice teachers should be introduced to both curved/oval and straight/rectangle visualizations of the ID process. This study has generated more questions than it has answered, and the question of the impact and importance of the visual display of an ID model on student perceptions of the process itself remains a viable area for additional research.

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